Mind Curve Mid-Term Test Series 2025-26

Class X | Test 06 – Answer Key

Chapters 1–9, 13, 14: Real Numbers, Polynomials, Pair of Linear Equations, Quadratic Equations, Arithmetic Progression, Similar Triangles, Coordinate Geometry, Introduction to Trigonometry, Applications of Trigonometry, Statistics & Probability

Q.No	Step-by-Step Solution	Marks per Step
	SECTION – A (Q1–20, 1 mark each)	
1	**Q1** $y = 0$ and $y = -7$ represent two distinct horizontal lines (both parallel to the x-axis) Distinct parallel lines never intersect, so the pair has no common solution **Answer: (d) no solution**	*1 mark for the correct option.*
2	**Q2** Let the common difference be d. 4th terms: $(-1+3d)$ and $(-8+3d)$ Difference $= (-1+3d) - (-8+3d) = -1+8 = 7$ (the d terms cancel, so the difference of 4th terms equals the difference of first terms) **Answer: (c) 7**	*1 mark for the correct option.*
3	**Q3** $\triangle ABC \sim \triangle DEF \Rightarrow \dfrac{AB}{DE} = \dfrac{BC}{EF}$ $\dfrac{3}{4} = \dfrac{6}{EF} \Rightarrow EF = \dfrac{6 \times 4}{3} = 8$ **Answer: (a) 8 cm**	*1 mark for the correct option.*
4	**Q4** In parallelogram PQRS, diagonals PR and QS bisect each other Midpoint of PR $= \left(\dfrac{3-3}{2}, \dfrac{4-2}{2}\right) = (0, 1)$ Let $S = (x, y)$. Midpoint of QS $= \left(\dfrac{-2+x}{2}, \dfrac{3+y}{2}\right) = (0, 1)$ $-2 + x = 0 \Rightarrow x = 2; \quad 3 + y = 2 \Rightarrow y = -1$ **Answer: (c) (2, –1)**	*1 mark for the correct option.*
5	**Q5** $\text{HCF}(a, b) = p^{\min(3,2)} q^{\min(4,3)} = p^2 q^3 \Rightarrow m = 2,\ n = 3$ $\text{LCM}(a, b) = p^{\max(3,2)} q^{\max(4,3)} = p^3 q^4 \Rightarrow r = 3,\ s = 4$ $(m+n)(r+s) = (2+3)(3+4) = 5 \times 7 = 35$ **Answer: (c) 35**	*1 mark for the correct option.*
6	**Q6** Since p is prime, its only factors are 1 and p — these are the required roots Sum of roots $= 1 + p$, product of roots $= 1 \times p = p$ Equation: $x^2 - (\text{sum})x + (\text{product}) = 0 \Rightarrow x^2 - (p+1)x + p = 0$ **Answer: (b)** $x^2 - (p+1)x + p = 0$	*1 mark for the correct option.*
7	**Q7** Squaring $\sin\theta + \cos\theta = \sqrt{2}$: $\quad 1 + 2\sin\theta\cos\theta = 2 \Rightarrow \sin\theta\cos\theta = \dfrac{1}{2}$	*1 mark for the correct option.*

Q.No	Step-by-Step Solution	Marks per Step
	$\tan\theta + \cot\theta = \dfrac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta} = \dfrac{1}{1/2} = 2$ **Answer: (b) 2**	
8	**Q8** $x\tan 60^\circ \cos 60^\circ = \sin 60^\circ \cot 60^\circ \Rightarrow x \times \sqrt{3} \times \dfrac{1}{2} = \dfrac{\sqrt{3}}{2} \times \dfrac{1}{\sqrt{3}}$ $x \times \dfrac{\sqrt{3}}{2} = \dfrac{1}{2} \Rightarrow x = \dfrac{1}{\sqrt{3}} = \tan 30^\circ$ **Answer: (b) tan30°**	*1 mark for the correct option.*
9	**Q9** For $f(x) = px^2 - 2x + 3p$: $\alpha + \beta = \dfrac{2}{p}, \quad \alpha\beta = \dfrac{3p}{p} = 3$ Given $\alpha + \beta = \alpha\beta$: $\dfrac{2}{p} = 3 \Rightarrow p = \dfrac{2}{3}$ **Answer: (b)** $\dfrac{2}{3}$	*1 mark for the correct option.*
10	**Q10** $\triangle ABC \sim \triangle DEF \Rightarrow \dfrac{AB}{DE} = \dfrac{4}{6} = \dfrac{2}{3}$ $BC = \dfrac{2}{3} \times EF = \dfrac{2}{3} \times 9 = 6; \quad CA = \dfrac{2}{3} \times FD = \dfrac{2}{3} \times 12 = 8$ Perimeter $= AB + BC + CA = 4 + 6 + 8 = 18$ cm **Answer: (d) 18 cm**	*1 mark for the correct option.*
11	**Q11** Since $DE \parallel BC$, $\triangle ADE \sim \triangle ABC$, giving $\dfrac{AE}{AC} = \dfrac{DE}{BC}$ $\dfrac{a}{a+b} = \dfrac{x}{y} \Rightarrow x = \dfrac{ay}{a+b}$ **Answer: (c)** $x = \dfrac{ay}{a+b}$	*1 mark for the correct option.*
12	**Q12** Since $AD \parallel BC$, $\triangle AOD \sim \triangle COB$ (AA, alternate angles), giving $\dfrac{AO}{OC} = \dfrac{AD}{BC}$ $\dfrac{1}{2} = \dfrac{4}{BC} \Rightarrow BC = 8$ cm **Answer: (c) 8cm**	*1 mark for the correct option.*
13	**Q13** First 3-digit multiple of 7: $105 = 7 \times 15$. Last: $994 = 7 \times 142$ Count $= 142 - 15 + 1 = 128$ **Answer: (c) 128**	*1 mark for the correct option.*
14	**Q14** For $p(x) = 2x^2 - 7x + k$: product of zeroes $= \dfrac{k}{2}$ For reciprocal zeroes, product $= 1$: $\dfrac{k}{2} = 1 \Rightarrow k = 2$ **Answer: (b) 2**	*1 mark for the correct option.*

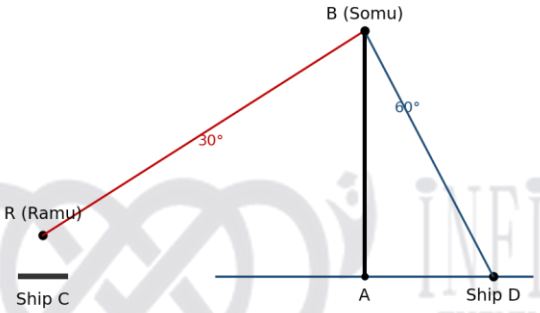
Q.No	Step-by-Step Solution	Marks per Step
15	**Q15** $5\tan\beta = 4 \Rightarrow \tan\beta = \frac{4}{5}$ Dividing numerator and denominator of $\frac{5\sin\beta - 2\cos\beta}{5\sin\beta + 2\cos\beta}$ by $\cos\beta$: $\frac{5\tan\beta - 2}{5\tan\beta + 2} = \frac{4-2}{4+2} = \frac{2}{6} = \frac{1}{3}$ **Answer: (a) $\frac{1}{3}$**	*1 mark for the correct option.*
16	**Q16** A.P.: $3, 8, 13, 18, \ldots$ has $a = 3,\ d = 5$ $a_n = 3 + (n-1)5 = 78 \Rightarrow (n-1)5 = 75 \Rightarrow n = 16$ **Answer: (d) 16th**	*1 mark for the correct option.*
17	**Q17** Midpoint of P(–6,5) and Q(–2,3) has x-coordinate $\frac{-6-2}{2} = -4$ $\frac{p}{3} = -4 \Rightarrow p = -12$ **Answer: (b) –12**	*1 mark for the correct option.*
18	**Q18** Total frequency $= 13 + 10 + 15 + 8 + 11 = 57$; $\frac{n}{2} = 28.5$ Since these are inclusive (gap-of-1) class intervals, the true (continuous) boundaries are obtained by subtracting/adding 0.5: e.g. 12–17 becomes 11.5–17.5 Cumulative frequencies: $13, 23, 38, \ldots$ — the class reaching 28.5 is 11.5–17.5, so the upper limit of the median class is 17.5 **Answer: (d) 17.5**	*1 mark for the correct option.*
19	**Q19** By the Midpoint theorem, $DE = \frac{1}{2}BC$, i.e. $BC = 2 \times DE$ $DE = \sqrt{(3-(-3))^2 + (5-(-3))^2} = \sqrt{36+64} = \sqrt{100} = 10$ $BC = 2 \times 10 = 20$ units — Assertion (A) is TRUE Reason (R) correctly states the Midpoint theorem, and is exactly why (A) holds **Answer: (a) Both Assertion and Reason are correct, and Reason is the correct explanation for Assertion.**	*1 mark for the correct option.*
20	**Q20** LCM $= \frac{\text{product of the numbers}}{\text{HCF}} = \frac{5780}{17} = 340$ — Assertion (A) is TRUE Reason (R), "HCF is always a factor of LCM", is a TRUE general fact, but it is not what directly explains why LCM = 340 here — that follows from the product–HCF–LCM relationship, not merely from HCF dividing LCM **Answer: (b) Both Assertion and Reason are correct, but Reason is not the correct explanation for Assertion.**	*1 mark for the correct option.*
SECTION – B (Q21–25, 2 marks each)		
21	**Q21** Total cards = 20 Primes from 1–20: $2, 3, 5, 7, 11, 13, 17, 19$ — 8 numbers. $P(\text{prime}) = \frac{8}{20} = \frac{2}{5}$	*1 mark for each probability.*

Q.No	Step-by-Step Solution	Marks per Step
	Multiples of 6 from 1–20: $6, 12, 18$ — 3 numbers. $P(\text{multiple of 6}) = \frac{3}{20}$ **Answer: P(prime) $= \frac{2}{5}$; P(multiple of 6) $= \frac{3}{20}$**	
22	**Q22** From $x + y = 2m$: $y = 2m - x$ Substitute into $mx - ny = m^2 + n^2$: $mx - n(2m - x) = m^2 + n^2$ $mx - 2mn + nx = m^2 + n^2 \Rightarrow x(m + n) = m^2 + 2mn + n^2 = (m + n)^2$ $x = m + n$ (for $m + n \neq 0$); then $y = 2m - (m + n) = m - n$ **Answer: x = m + n, y = m − n**	*1 mark for finding x; 1 mark for finding y.*
23	**Q23** **(A)** Let the x-axis divide A(1,–5), B(–4,5) in ratio $k : 1$ y-coordinate of division point $= \frac{5k - 5}{k + 1} = 0 \Rightarrow 5k = 5 \Rightarrow k = 1$ Ratio $= 1 : 1$; $x = \frac{1(-4) + 1(1)}{1 + 1} = \frac{-3}{2}$ **Answer: Ratio = 1 : 1; point of division $= \left(-\frac{3}{2}, 0\right)$** **(B)** Let the line $x - 3y = 7$ divide A(2,–3), B(3,7) in ratio $k : 1$ Point $= \left(\frac{3k + 2}{k + 1}, \frac{7k - 3}{k + 1}\right)$ Substitute: $\frac{3k + 2}{k + 1} - \frac{3(7k - 3)}{k + 1} = 7 \Rightarrow -18k + 11 = 7(k + 1)$ $-18k + 11 = 7k + 7 \Rightarrow 4 = 25k \Rightarrow k = \frac{4}{25}$ **Answer: Ratio = 4 : 25**	*1 mark for the section-formula setup; 1 mark for the final ratio/coordinates.*
24	**Q24** In $\triangle ABD$: $\angle BAD = \angle 1$ and $\angle BDA = \angle 2$; since $\angle 1 = \angle 2$ (given), $\triangle ABD$ is isosceles with $AB = BD$ Given $\frac{AD}{AE} = \frac{AC}{BD}$; substituting $BD = AB$: $\frac{AD}{AE} = \frac{AC}{AB} \Rightarrow \frac{AB}{AC} = \frac{AE}{AD}$ In $\triangle BAE$ and $\triangle CAD$: $\frac{AB}{AC} = \frac{AE}{AD}$ (shown) and $\angle BAE = \angle CAD$ (the common angle at A, $= \angle 1 = \angle 2$) By SAS similarity, $\triangle BAE \sim \triangle CAD$ **Answer: $\triangle BAE \sim \triangle CAD$ (shown).**	*1 mark for showing $\triangle ABD$ isosceles; 1 mark for the ratio $\frac{AB}{AC} = \frac{AE}{AD}$.*
25	**Q25** **(A)** $\sin(A + B) = 1 \Rightarrow A + B = 90°$ (the only value in the given range) $2\cos(A - B) = \sqrt{3} \Rightarrow \cos(A - B) = \frac{\sqrt{3}}{2} \Rightarrow A - B = 30°$ Adding: $2A = 120° \Rightarrow A = 60°$; then $B = 90° - 60° = 30°$ **Answer: A = 60°, B = 30°**	*1 mark for setting up the equation(s); 1 mark for the final angle(s).*

Q.No	Step-by-Step Solution	Marks per Step
	(B) Dividing numerator and denominator of the LHS by $\cos\theta$: $\dfrac{1-\tan\theta}{1+\tan\theta} = \dfrac{1-\sqrt{3}}{1+\sqrt{3}}$ Cross-multiplying: $(1-\tan\theta)(1+\sqrt{3}) = (1+\tan\theta)(1-\sqrt{3})$ $1+\sqrt{3}-\tan\theta-\sqrt{3}\tan\theta = 1-\sqrt{3}+\tan\theta-\sqrt{3}\tan\theta$ $2\sqrt{3} = 2\tan\theta \Rightarrow \tan\theta = \sqrt{3} \Rightarrow \theta = 60°$ **Answer: $\theta = 60°$**	
SECTION – C (Q26–31, 3 marks each)		
26	**Q26** Total students = 30: $2+p+7+6+6+6 = 30 \Rightarrow p = 3$ Class marks (midpoints): $17.5, 32.5, 47.5, 62.5, 77.5, 92.5$ $\Sigma f_i x_i = 2(17.5)+3(32.5)+7(47.5)+6(62.5)+6(77.5)+6(92.5)$ $= 35+97.5+332.5+375+465+555 = 1860$ Mean $= \dfrac{\Sigma f_i x_i}{\Sigma f_i} = \dfrac{1860}{30} = 62$ **Answer: p = 3; Mean marks = 62**	*1 mark for finding p; 1 mark for the class marks/setup; 1 mark for the mean.*
27	**Q27** Total outcomes = 52 (i) Black cards = 26, queens = 4, black queens = 2 (overlap). $P = \dfrac{26+4-2}{52} = \dfrac{28}{52} = \dfrac{7}{13}$ (ii) Red cards = 26, kings = 4, red kings = 2 (overlap). Red or king $= 26+4-2 = 28$; neither $= 52-28 = 24$. $P = \dfrac{24}{52} = \dfrac{6}{13}$ (iii) Black kings: king of spades and king of clubs = 2. $P = \dfrac{2}{52} = \dfrac{1}{26}$ **Answer: (i) $\frac{7}{13}$ (ii) $\frac{6}{13}$ (iii) $\frac{1}{26}$**	*1 mark for each of the three probabilities.*
28	**Q28** Suppose, to the contrary, that $5+2\sqrt{3}$ is rational, say $\dfrac{p}{q}$ $(q \neq 0)$ Then $2\sqrt{3} = \dfrac{p}{q} - 5 = \dfrac{p-5q}{q}$, so $\sqrt{3} = \dfrac{p-5q}{2q}$, which is rational This contradicts the given fact that $\sqrt{3}$ is irrational Hence our assumption is wrong, and $5+2\sqrt{3}$ is irrational **Answer: Proved by contradiction.**	*1 mark for the assumption/setup; 1 mark for expressing $\sqrt{3}$ as rational; 1 mark for the contradiction.*
29	**Q29** Zeroes of $2x^2-5x-3$: $2x^2-6x+x-3 = 2x(x-3)+1(x-3) = (2x+1)(x-3)$ Zeroes: $x = 3$ and $x = -\dfrac{1}{2}$ Double these: 6 and -1 — these are the zeroes of x^2+px+q Sum $= 6+(-1) = 5 = -p \Rightarrow p = -5$; Product $= 6\times(-1) = -6 = q$ **Answer: p = –5, q = –6**	*1 mark for the zeroes of the given polynomial; 1 mark for doubling them; 1 mark for p and q.*
30	**Q30** $S_6 = \dfrac{6}{2}[2a+5d] = 36 \Rightarrow 2a+5d = 12$	*1 mark for each equation; 1 mark for a, d; 1 mark for S_{10}.*

Q.No	Step-by-Step Solution	Marks per Step
	$S_{16} = \frac{16}{2}[2a + 15d] = 256 \Rightarrow 2a + 15d = 32$ Subtracting: $10d = 20 \Rightarrow d = 2$; then $2a + 10 = 12 \Rightarrow a = 1$ $S_{10} = \frac{10}{2}[2a + 9d] = 5[2 + 18] = 5 \times 20 = 100$ **Answer: 100**	
31	**Q31** **Prove the following identity:** $1 + \cot A + \tan A = 1 + \frac{\cos A}{\sin A} + \frac{\sin A}{\cos A} = \frac{\sin A \cos A + 1}{\sin A \cos A}$ $\sec^3 A - \operatorname{cosec}^3 A = \frac{1}{\cos^3 A} - \frac{1}{\sin^3 A} = \frac{\sin^3 A - \cos^3 A}{\sin^3 A \cos^3 A}$ $\text{LHS} = \frac{(\sin A \cos A + 1)}{\sin A \cos A} \times (\sin A - \cos A) \times \frac{\sin^3 A \cos^3 A}{\sin^3 A - \cos^3 A}$ Using $\sin^3 A - \cos^3 A = (\sin A - \cos A)(1 + \sin A \cos A)$, the factors $(\sin A - \cos A)$ and $(1 + \sin A \cos A)$ cancel $\text{LHS} = \frac{\sin^3 A \cos^3 A}{\sin A \cos A} = \sin^2 A \cos^2 A = \text{RHS}$ **Answer: Identity proved.** **OR — Prove that:** Multiply numerator and denominator of the LHS by $(\cos A + \sin A + 1)$ Numerator: $(\cos A + 1)^2 - \sin^2 A = 2\cos^2 A + 2\cos A = 2\cos A(\cos A + 1)$ Denominator: $(\cos A + \sin A)^2 - 1 = 2\sin A \cos A$ So LHS $= \frac{2\cos A(\cos A + 1)}{2\sin A \cos A} = \frac{\cos A + 1}{\sin A} = \cot A + \operatorname{cosec} A$ — this proves the first equality For the second equality: $\operatorname{cosec} A + \cot A = \frac{1 + \cos A}{\sin A}$; multiply numerator and denominator by $(1 - \cos A)$ $= \frac{1 - \cos^2 A}{\sin A(1 - \cos A)} = \frac{\sin^2 A}{\sin A(1 - \cos A)} = \frac{\sin A}{1 - \cos A}$ **Answer:** $\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \operatorname{cosec} A + \cot A = \frac{\sin A}{1 - \cos A}$ **(both equalities proved).**	*3 marks for a correctly-justified, step-wise proof of either identity.*
SECTION – D (Q32–35, 5 marks each)		
32	**Q32** **(A) Basic Proportionality Theorem** Given: $\triangle ABC$ with $DE \parallel BC$, D on AB, E on AC. To prove: $\frac{AD}{DB} = \frac{AE}{EC}$ Construction: Join BE and CD; draw $EM \perp AB$ and $DN \perp AC$ $\text{ar}(\triangle ADE) = \frac{1}{2} \times AD \times EM, \quad \text{ar}(\triangle DBE) = \frac{1}{2} \times DB \times EM$ $\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle DBE)} = \frac{AD}{DB}$; similarly $\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle DEC)} = \frac{AE}{EC}$ Since $\triangle DBE$ and $\triangle DEC$ stand on the same base DE and lie between the same parallels DE and BC, $\text{ar}(\triangle DBE) = \text{ar}(\triangle DEC)$ So $\frac{AD}{DB} = \frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle DBE)} = \frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle DEC)} = \frac{AE}{EC}$	*Up to 5 marks for a complete, correctly-justified proof with construction and all steps shown.*

Q.No	Step-by-Step Solution	Marks per Step
	Answer: $\frac{AD}{DB} = \frac{AE}{EC}$ **(proved).** **(B) Application to a trapezium** Let ABCD be a trapezium with $AB \parallel CD$; diagonals meet at O. Let the line through O parallel to AB meet AD at E and BC at F Since $AB \parallel CD$, $\triangle AOB \sim \triangle COD$ (AA), giving $\frac{AO}{OC} = \frac{BO}{OD} = \frac{AB}{CD}$ In $\triangle DAB$, $EO \parallel AB$ (E on DA, O on DB), so by the theorem proved above: $\frac{DE}{EA} = \frac{DO}{OB} = \frac{CD}{AB}$ In $\triangle CAB$, $OF \parallel AB$ (O on CA, F on CB), so similarly: $\frac{CF}{FB} = \frac{CO}{OA} = \frac{CD}{AB}$ So $\frac{DE}{EA} = \frac{CF}{FB}$, i.e. $\frac{AE}{ED} = \frac{BF}{FC}$ — the non-parallel sides AD and BC are divided in the same ratio **Answer:** $\frac{AE}{ED} = \frac{BF}{FC}$ **(shown).**	
33	**Q33** Let the larger pipe alone take x hours to fill the pool; the smaller takes $x+10$ hours In 4 hours (larger) + 9 hours (smaller), half the pool is filled: $\frac{4}{x} + \frac{9}{x+10} = \frac{1}{2}$ $8(x+10) + 18x = x(x+10) \Rightarrow 8x + 80 + 18x = x^2 + 10x$ $x^2 - 16x - 80 = 0$ $x = \frac{16 \pm \sqrt{256+320}}{2} = \frac{16 \pm 24}{2} \Rightarrow x = 20$ (rejecting $x = -4$) **Answer: Larger pipe: 20 hours; smaller pipe: 30 hours**	*1 mark for the equation; 2 marks for simplifying to the quadratic; 1 mark for solving; 1 mark for both final times.*
34	**Q34** **(A)** Let the usual speed be x km/hr; usual time $= \frac{600}{x}$ hours Reduced speed $= x - 200$; new time $= \frac{600}{x-200}$ $\frac{600}{x-200} - \frac{600}{x} = \frac{1}{2}$ $600x - 600(x-200) = \frac{1}{2}x(x-200) \Rightarrow 120000 = \frac{x^2 - 200x}{2}$ $x^2 - 200x - 240000 = 0 \Rightarrow x = \frac{200 \pm \sqrt{40000+960000}}{2} = \frac{200 \pm 1000}{2}$ $x = 600$ (rejecting the negative root) **Answer: Scheduled duration** $= \frac{600}{600} = 1$ **hour**	*1 mark for the equation; 2 marks for simplifying to the quadratic; 1 mark for solving; 1 mark for the final answer.*
35	**Q35** Since the "Below" classes have width 10 and start from "Below 15", the true class intervals are 5–15, 15–25, 25–35, 35–45, 45–55, 55–65 Class frequencies (from consecutive differences of cumulative frequencies): 6, 11, 21, 23, 14, 5 (total 80) For the median: $\frac{n}{2} = 40$. Cumulative frequencies $6, 17, 38, 61, 75, 80$ — the class reaching 40 is 35–45 (median class), with $cf = 38,\ f = 23,\ l = 35,\ h = 10$ Median $= l + \frac{\frac{n}{2} - cf}{f} \times h = 35 + \frac{40-38}{23} \times 10 = 35 + \frac{20}{23} \approx 35.87$	*1 mark for the class frequencies; 2 marks for the median; 2 marks for the mode.*

Q.No	Step-by-Step Solution	Marks per Step
	For the mode: the highest frequency (23) is in class 35–45 (modal class), with $f_1 = 23,\ f_0 = 21,\ f_2 = 14,\ l = 35,\ h = 10$ $\text{Mode} = l + \dfrac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h = 35 + \dfrac{23 - 21}{46 - 21 - 14} \times 10 = 35 + \dfrac{20}{11} \approx 36.82$ **Answer: Median ≈ 35.87 years; Mode ≈ 36.82 years**	
	SECTION – E (Q36–38, 4 marks each)	
36	**Q36** Let A be the base of the lighthouse, B its top, R the point on ship C's deck (10 m above water) where Ramu stands, and D the point where ship D meets the water **(i) Diagram** Ships C and D lie on opposite sides of the lighthouse AB, all in the same straight line Ramu (R) is 10 m above the water on ship C; the line of sight RB makes a 30° angle of elevation, and RB = 100 m Somu (B), at the top of the lighthouse, observes ship D with a 60° angle of depression  **Answer: See figure.** **(ii) Height of the light house** In the right triangle at R: $\sin 30° = \dfrac{\text{height of } B - 10}{RB} = \dfrac{h - 10}{100}$ $h - 10 = 100 \times \dfrac{1}{2} = 50 \Rightarrow h = 60$ m **Answer: 60 m** **(iii)(a) Distance between the ships** Horizontal distance from ship C to the lighthouse: $\cos 30° = \dfrac{d_1}{100} \Rightarrow d_1 = 100 \times \dfrac{\sqrt{3}}{2} = 50\sqrt{3} = 50 \times 1.73 = 86.5$ m Horizontal distance from the lighthouse to ship D: $\tan 60° = \dfrac{60}{d_2} \Rightarrow d_2 = \dfrac{60}{\sqrt{3}} = 20\sqrt{3} = 20 \times 1.73 = 34.6$ m Distance between the ships $= d_1 + d_2 = 86.5 + 34.6 = 121.1$ m **Answer: 121.1 m** **(iii)(b) [OR] Distance between Somu and ship D** In the right triangle at the lighthouse base: $\sin 60° = \dfrac{60}{BD} \Rightarrow BD = \dfrac{60}{\sqrt{3}/2} = \dfrac{120}{\sqrt{3}} = 40\sqrt{3} = 40 \times 1.73 = 69.2$ m **Answer: 69.2 m**	*(i) 1 mark for a correctly labelled diagram. (ii) 1 mark. (iii) 2 marks for either part (1 mark for the horizontal distance(s); 1 mark for the final length).*

Q.No	Step-by-Step Solution	Marks per Step
37	**Q37** From the figure: inner octagon vertices $A(-2,2),\ B(2,2),\ C(4,4),\ D(4,7),\ E(2,9),\ F(-2,9),\ G(-4,7),\ H(-4,4)$; outer points $W(-6,2),\ X(-4,0),\ O(6,9),\ P(4,11)$ **(i) Length of segment BF** $B=(2,2),\ F=(-2,9)$ $BF=\sqrt{(2-(-2))^2+(2-9)^2}=\sqrt{16+49}=\sqrt{65}$ **Answer: $\sqrt{65}\approx 8.06$ units** **(ii) Coordinates of Z (intersection of diagonals of WXOP)** The diagonals of quadrilateral WXOP are WO and XP Midpoint of WO $=\left(\frac{-6+6}{2},\frac{2+9}{2}\right)=(0,5.5)$ Midpoint of XP $=\left(\frac{-4+4}{2},\frac{0+11}{2}\right)=(0,5.5)$ Both diagonals share this midpoint, so WXOP is a parallelogram and its diagonals bisect each other here **Answer: Z = (0, 5.5)** **(iii)(a) Point on the y-axis equidistant from A and G** Let the point be $(0,k)$. $A=(-2,2),\ G=(-4,7)$ $(0-(-2))^2+(k-2)^2=(0-(-4))^2+(k-7)^2$ $4+(k-2)^2=16+(k-7)^2\Rightarrow 8-4k=65-14k\Rightarrow 10k=57$ $k=5.7$ **Answer: (0, 5.7)** **(iii)(b) [OR] Area of trapezium AFGH** $A(-2,2),\ F(-2,9),\ G(-4,7),\ H(-4,4)$; sides AF and GH are both vertical, so they are parallel $AF=9-2=7;\ GH=7-4=3$; distance between them $=|-2-(-4)|=2$ Area $=\frac{1}{2}(AF+GH)\times$ height $=\frac{1}{2}(7+3)\times 2=10$ **Answer: 10 square units**	*(i) 1 mark. (ii) 1 mark. (iii) 2 marks for either part (1 mark for the setup; 1 mark for the final value).*
38	**Q38** Production forms an A.P.; let first-year production be a and the yearly increase be d **(i) Production in the first year** $a_6=a+5d=800;\quad a_9=a+8d=1130$ Subtracting: $3d=330\Rightarrow d=110$; then $a=800-5(110)=250$ **Answer: 250 rollers** **(ii) Yearly increase** From above, $d=110$ **Answer: 110 rollers** **(iii)(a) Year in which production was 1350 rollers** $a+(n-1)d=1350\Rightarrow 250+(n-1)(110)=1350$ $(n-1)(110)=1100\Rightarrow n-1=10\Rightarrow n=11$	*(i) 1 mark for a, d. (ii) 1 mark. (iii) 2 marks for either part (1 mark for the equation; 1 mark for the final answer).*

Q.No	Step-by-Step Solution	Marks per Step
	Answer: 11th year **(iii)(b) [OR] Production in the 8th year** $a_8 = a + 7d = 250 + 7(110) = 250 + 770 = 1020$ **Answer: 1020 rollers**	